

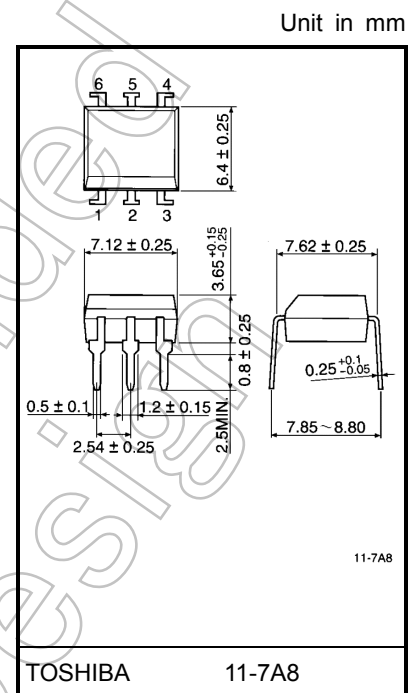
TOSHIBA Photocoupler GaAs IRed & Photo-Transistor

TLP531, TLP532

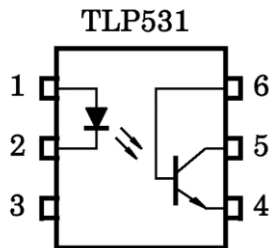
Programmable Controllers
AC / DC-Input Module
Solid State Relay

The TOSHIBA TLP531 and TLP532 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP. TLP532 has no-base internal connection for high-EMI environments.

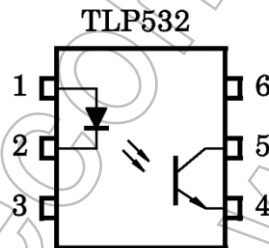
- Collector-emitter voltage : 55 V (min)
- Current transfer ratio : 50% (min)
Rank GB : 100% (min)
- Isolation voltage : 2500 Vrms (min)
- UL recognized : UL1577, file no. E67349
- c-UL approved : CSA Component Acceptance Service
No. 5A, File No.E67349



Pin Configurations (top view)



- 1 : ANODE
- 2 : CATHODE
- 3 : N.C.
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : BASE



- 1 : ANODE
- 2 : CATHODE
- 3 : N.C.
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : N.C.

Weight: 0.4g (typ.)

Start of commercial production
1979-07

Current Transfer Ratio

| Classification (Note 1) | Current Transfer Ratio (%) (I_C/I_F) | | Marking Of Classification |
|----------------------------|--|-----|---|
| | $I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ\text{C}$ | | |
| | Min | Max | |
| Blank | 50 | 600 | Blank, Y [■] , YE, G, G [■] , GR, B, BL, GB |
| Rank Y | 50 | 150 | YE, Y [■] |
| Rank GR | 100 | 300 | GR, G, G [■] |
| Rank BL | 200 | 600 | BL, B |
| Rank GB | 100 | 600 | GB, G, G [■] , GR, B, BL |
| Rank YH | 75 | 150 | Y [■] |
| Rank GRL | 100 | 200 | G |
| Rank GRH | 150 | 300 | G [■] |
| Rank BLL | 200 | 400 | B |

Note 1: EX, Rank GB: TLP531 (GB), TLP532(GB)

Note: Application, type name for certification test, please use standard product type name, i. e.

TLP531 (GB): TLP531

TLP532 (GB): TLP532

Not Recommended for New Design

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | Unit |
|--|--|-----------------------------|------------|-----------|
| LED | Forward current | I_F | 70 | mA |
| | Forward current derating (Ta ≥ 50°C) | $\Delta I_F/^\circ\text{C}$ | -0.93 | mA/°C |
| | Peak forward current (100 μs pulse, 100 pps) | I_{FP} | 1 | A |
| | Reverse voltage | V_R | 5 | V |
| | Diode power dissipation | P_D | 50 | mW |
| | Diode power dissipation derating (Ta ≥ 50°C) | $\Delta P_D/^\circ\text{C}$ | -0.67 | mW/°C |
| | Junction temperature | T_j | 125 | °C |
| Detector | Collector-emitter voltage | V_{CEO} | 55 | V |
| | Collector-base voltage (TLP531) | V_{CBO} | 80 | V |
| | Emitter-collector voltage | V_{ECO} | 7 | V |
| | Emitter-base voltage (TLP531) | V_{EBO} | 7 | V |
| | Collector current | I_C | 50 | mA |
| | Power dissipation | P_C | 150 | mW |
| | Power dissipation derating (Ta ≥ 25°C) | $\Delta P_C/^\circ\text{C}$ | -1.5 | mW/°C |
| | Junction temperature | T_j | 125 | °C |
| Storage temperature range | | T_{stg} | -55 to 125 | °C |
| Operating temperature range | | T_{opr} | -55 to 100 | °C |
| Lead soldering temperature (10 s) | | T_{sol} | 260 | °C |
| Total package power dissipation | | P_T | 250 | mW |
| Total package power dissipation derating (Ta ≥ 25°C) | | $\Delta P_T/^\circ\text{C}$ | -2.5 | mW/°C |
| Isolation voltage (AC, 1minute, R.H. ≤ 60%) (Note 1) | | BV_S | 2500 | V_{rms} |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: This device is considered as a two-terminal device: All pins on the LED side are shorted together, and all pin on the photodetector side are shorted together.

Recommends Operating Conditions

| Characteristic | Symbol | Min | Typ. | Max | Unit |
|-----------------------|-----------|-----|------|-----|------|
| Supply voltage | V_{CC} | — | 5 | 24 | V |
| Forward current | I_F | — | 16 | 25 | mA |
| Collector current | I_C | — | 1 | 10 | mA |
| Operating temperature | T_{opr} | -25 | — | 85 | °C |

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

Electrical Characteristics (Ta = 25°C)

| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|------------------------------------|---|----------------------|---|-----|------|-----|------|
| LED | Forward voltage | V _F | I _F = 10 mA | 1.0 | 1.15 | 1.3 | V |
| | Reverse current | I _R | V _R = 5 V | — | — | 10 | μA |
| | Capacitance | C _T | V = 0 V, f = 1 MHz | — | 30 | — | pF |
| Detector | Collector-emitter breakdown voltage | V _{(BR)CEO} | I _C = 0.5 mA | 55 | — | — | V |
| | Emitter-collector breakdown voltage | V _{(BR)ECO} | I _E = 0.1 mA | 7 | — | — | V |
| | Collector-base breakdown voltage (TLP531) | V _{(BR)CBO} | I _C = 0.1 mA | 80 | — | — | V |
| | Emitter-base breakdown voltage (TLP531) | V _{(BR)EBO} | I _E = 0.1 mA | 7 | — | — | V |
| | Collector dark current (TLP531) | I _{CEO} | V _{CE} = 24 V | — | 10 | 100 | nA |
| | | | V _{CE} = 24 V, Ta = 85°C | — | 2 | 50 | |
| | Collector cut-off current (TLP531) | I _{CER} | V _{CE} = 24 V, Ta = 85°C R _{BE} = 1 MΩ | — | 0.5 | 10 | μA |
| | Collector cut-off current (TLP531) | I _{CBO} | V _{CB} = 10 V | — | 0.1 | — | nA |
| | DC current gain (TLP531) | h _{FE} | V _{CE} = 5 V, I _C = 0.5 mA | — | 400 | — | — |
| Capacitance (collector to emitter) | C _{CE} | V = 0 V, f = 1 MHz | — | 10 | — | pF | |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|-------------------------------------|---|-----|------|-----|------|
| Current transfer ratio | I _C /I _F | I _F = 5 mA, V _{CE} = 5 V Rank GB | 50 | — | 600 | % |
| | | | 100 | — | 600 | |
| Saturated CTR | I _C /I _{F(sat)} | I _F = 1 mA, V _{CE} = 0.4 V Rank GB | — | 60 | — | % |
| | | | 30 | — | — | |
| Collector-emitter saturation voltage | V _{CE(sat)} | I _C = 2.4 mA, I _F = 8 mA | — | — | 0.4 | V |
| | | I _C = 0.2 mA, I _F = 1 mA Rank GB | — | 0.2 | — | |
| | | | — | — | 0.4 | |
| Off-state collector current | I _{C(off)} | V _F = 0.7 V, V _{CE} = 48 V | — | 1 | 10 | μA |

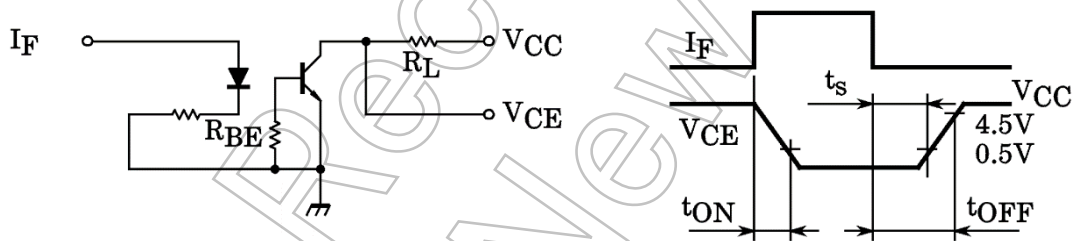
Isolation Characteristics (Ta = 25°C)

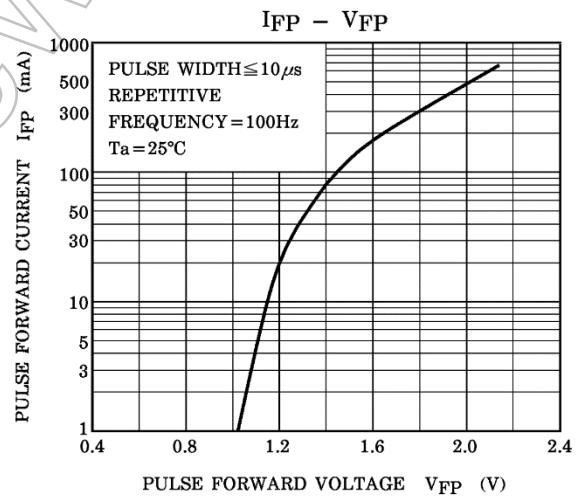
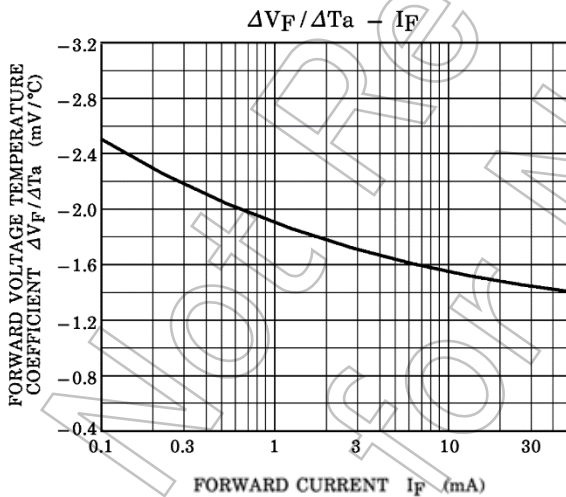
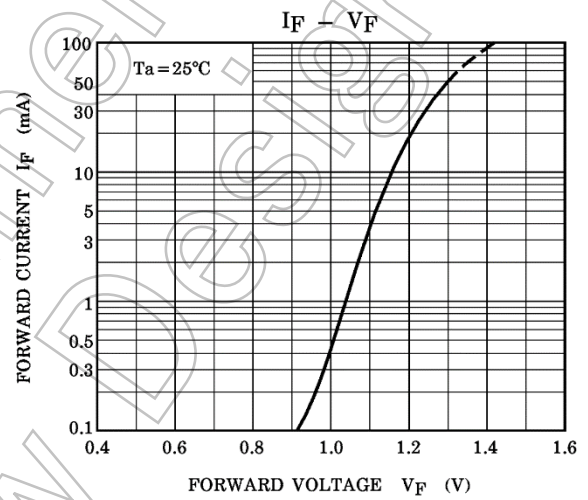
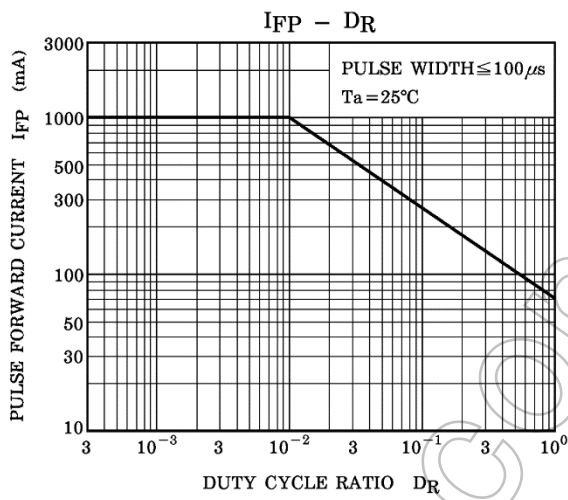
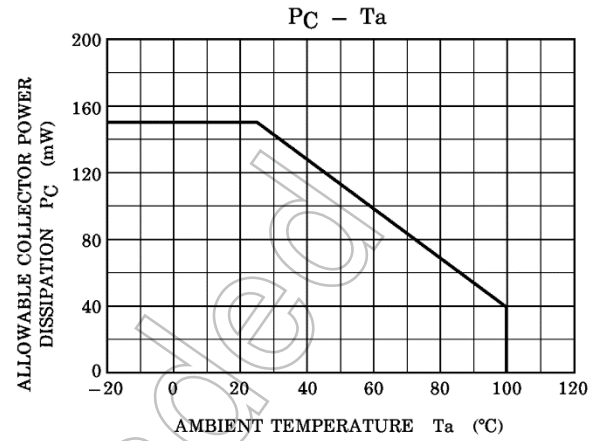
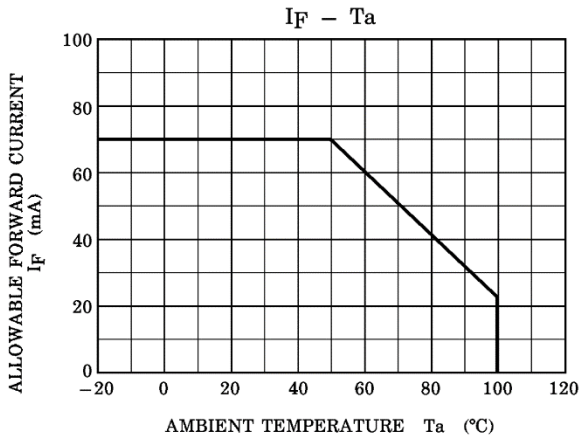
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------|--------|-----------------------|--------------------|-----------|-----|------|
| Capacitance (input to output) | Cs | Vs = 0 V, f = 1 MHz | — | 0.8 | — | pF |
| Isolation resistance | Rs | Vs = 500V, R.H. ≤ 60% | 5×10^{10} | 10^{14} | — | Ω |
| Isolation voltage | BVs | AC, 60 s | 2500 | — | — | Vrms |
| | | AC, 1 s, in oil | — | 5000 | — | Vdc |
| | | DC, 60 s, in oil | — | 5000 | — | |

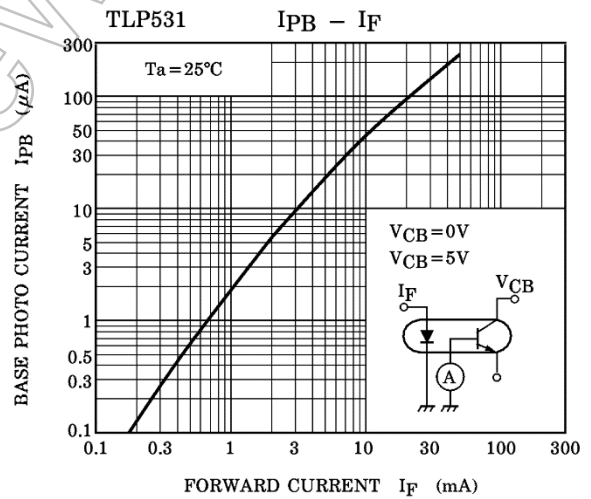
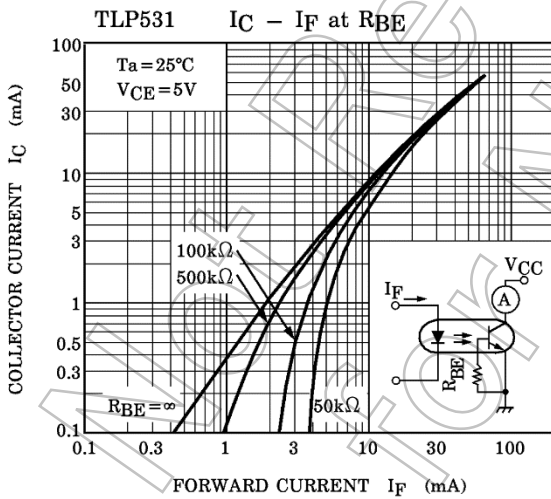
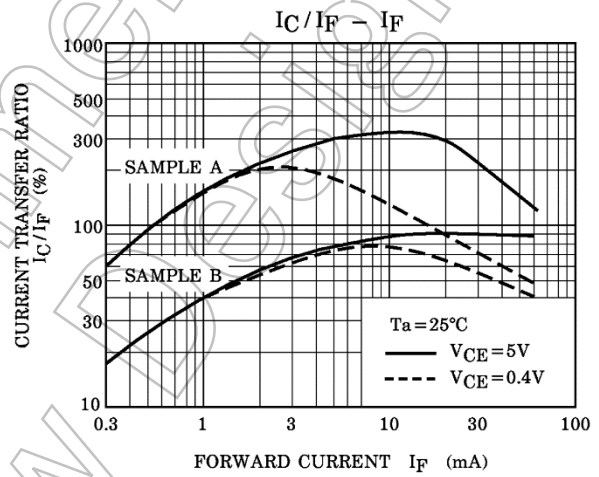
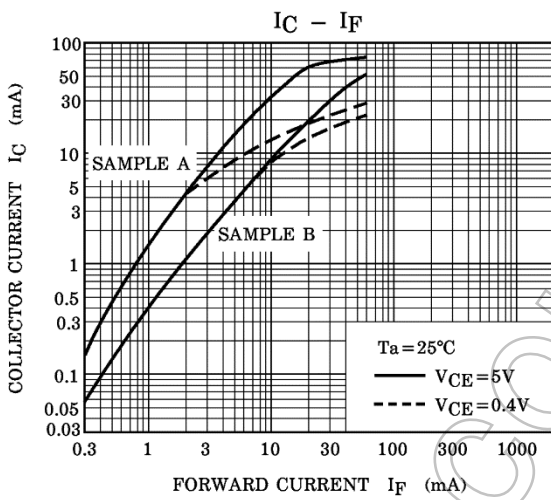
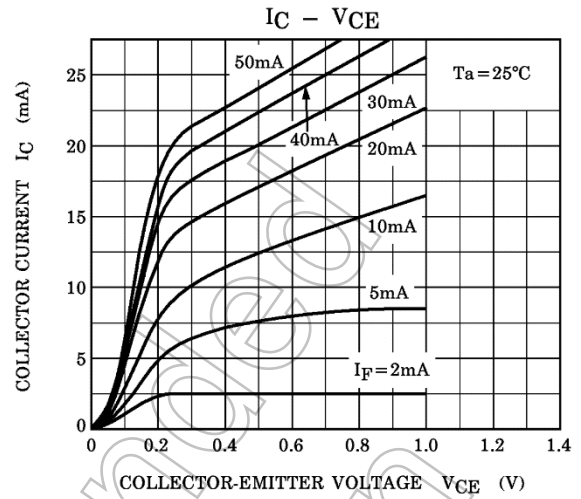
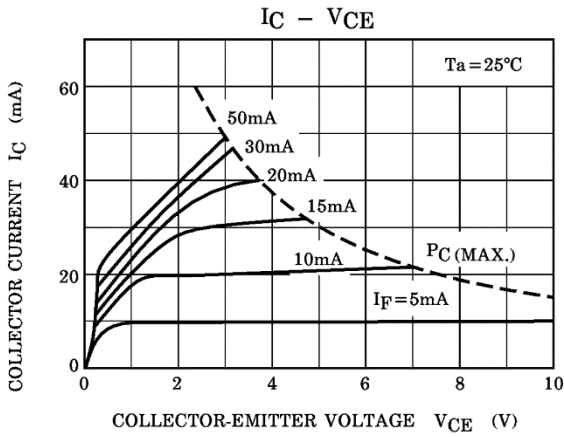
Switching Characteristics (Ta = 25°C)

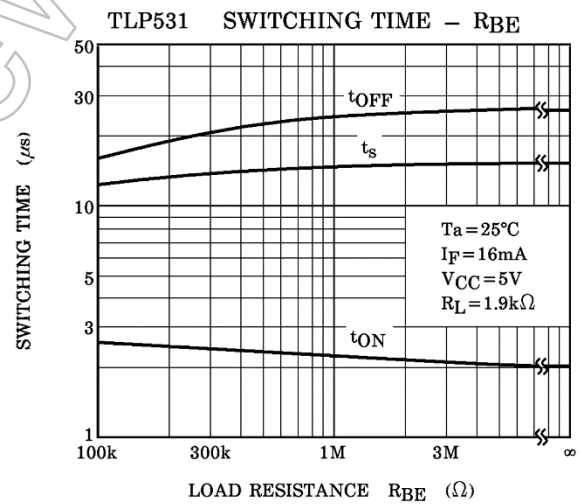
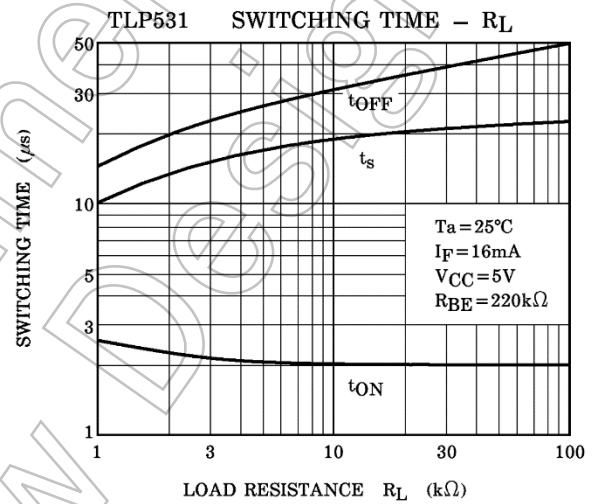
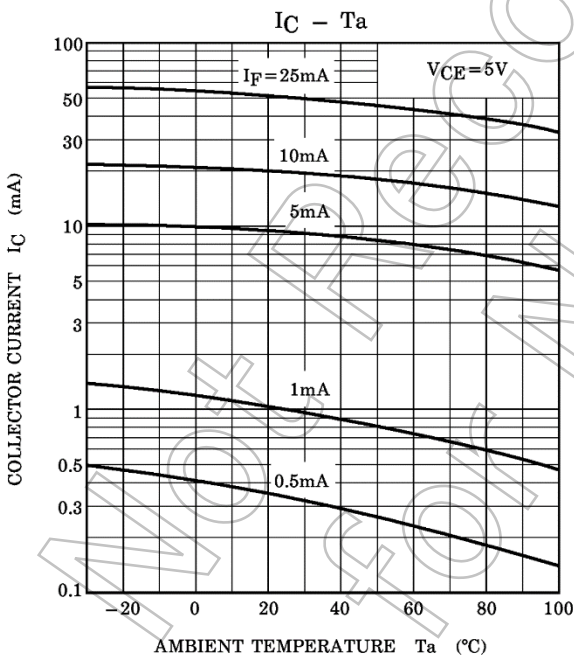
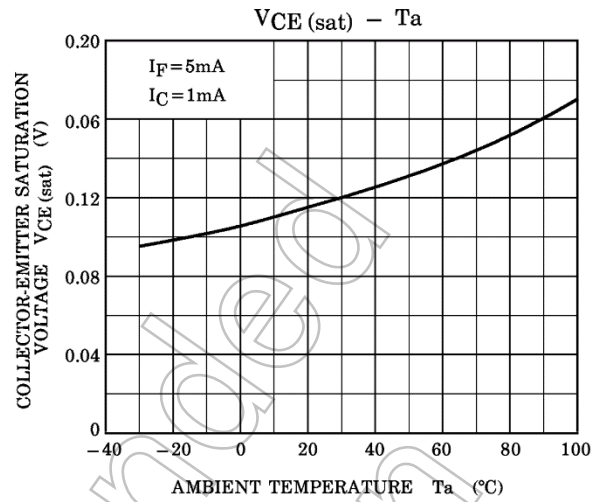
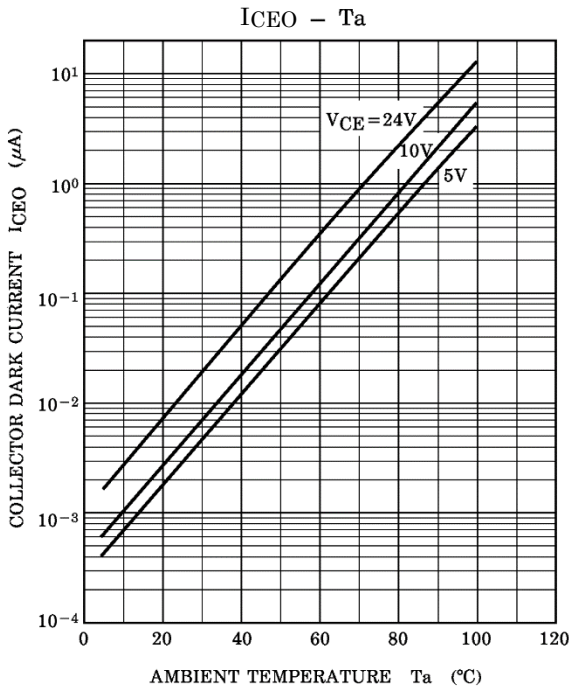
| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------|--------|--|-----|------|-----|------|
| Rise time | tr | VCC = 10 V, IC = 2 mA RL = 100 Ω | — | 2 | — | μs |
| Fall time | tf | | — | 3 | — | |
| Turn-on time | tON | | — | 3 | — | |
| Turn-off time | tOFF | | — | 3 | — | |
| Turn-on time | tON | RL = 1.9 kΩ RBE = open VCC = 5V, IF = 16mA (Fig.1) | — | 2 | — | μs |
| Storage time | ts | | — | 15 | — | |
| Turn-off time | tOFF | RL = 1.9 kΩ RBE = 220 kΩ (TLP531) VCC = 5V, IF = 16mA (Fig.1) | — | 25 | — | μs |
| Turn-on time | tON | | — | 2 | — | |
| Storage time | ts | | — | 12 | — | |
| Turn-off time | tOFF | | — | 20 | — | |

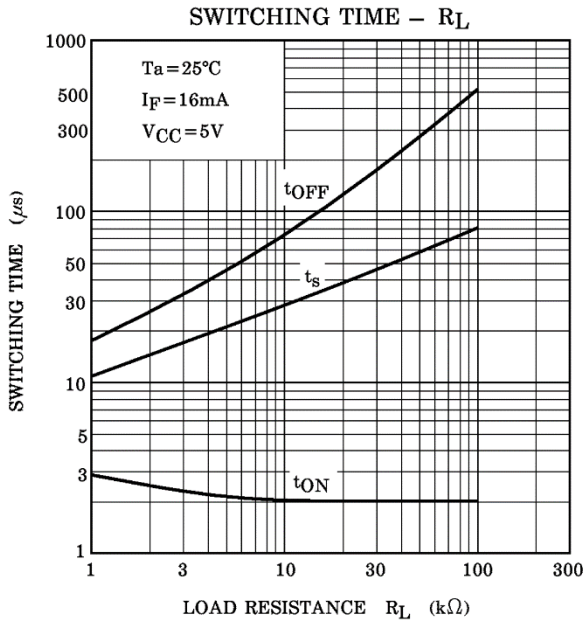
Fig. 1 Switching time test circuit











Not Recommended for New Design

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